December 29, 1997

Mr. Ted C. Feigenbaum
Executive Vice President and Chief Nuclear Officer
c/o R. A. Mellor, Vice President
Site Operations and Decommissioning
Connecticut Yankee Atomic Power Company
362 Injun Hollow Road
East Hampton, CT 06424-3099

SUBJECT: NRC INSPECTION NO. 50-213/97-11

Dear Mr. Davis:

This letter refers to special reactive inspections conducted by Dr. Jason C. Jang of this office on October 6-9, and November 3-7, 1997, of activities authorized by NRC license No. DPR-61 at the Haddam Neck Station, East Haddam, Connecticut and the discussion of our findings held with Mr. R. Mellor and other members of your staff at the conclusion of the inspections.

Our inspections focussed on your programs for radioactive liquid control, particularly for tritium. These inspections consisted of selective examinations of procedures and representative records, interviews with personnel, and observations by the inspector.

Based on our historical review and understanding of practices, the licensee implemented an acceptable tritium monitoring program, including tritium measurement laboratory QA/QC for the external containment sump (ECS) water samples. We concluded that the licensee was in conformance with the applicable Technical Specifications tritium release limits since the commencement of plant operations. We also concluded that there was no significant impact to public health and safety and the environment due to tritium releases.

Your cooperation with us in this matter is appreciated.

Sincerely,

ORIGINAL SIGNED BY:

John R. White, Chief
Radiation Safety Branch
Division of Reactor Safety

Docket No. 50-213
License No. DPR-61

Enclosures: NRC Inspection Report No. 50-213/97-11

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No: 50-213
License No: DPR-61

Report No: 50-213/97-11

Licensee: Connecticut Yankee Atomic Power Company
Hartford, CT 06141-0270

Facility: Haddam Neck Station

Location: Haddam, Connecticut

Dates: October 6-9, and November 3-7, 1997

Inspector: Dr. Jason C. Jang, Senior Radiation Specialist

Approved by: John R. White, Chief
Radiation Safety Branch
Division of Reactor Safety

Report Details

R1 Radiological Protection and Chemistry (RP&C) Controls

R1.1 Tour of Selected Radiological Environmental Monitoring Program (REMP) Facilities

a. Inspection Scope (84750-03)

The inspection consisted of walkdown of: (1) the meteorological monitoring station; (2) specific REMP sampling and monitoring stations along the discharge canal (i.e., sediment sampling and thermoluminescent dosimeter (TLD) stations; and (3) process water well (i.e., A and B pump stations).

b. Observations and Findings

The inspector toured the meteorological monitoring tower. The meteorological monitoring tower had two levels (at 33 ft and 200 ft) at which monitoring sensors (wind speed, wind direction, and air temperature detectors) were mounted, as required by Section 3/4.3.4 of the TS. The inspector noted that the true wind speed and direction were not able to be measured at the 33 ft level sensors because of overgrown trees that perturbed windflow. The only sensor being used at the 33 ft level was a temperature sensor. The inspector noted that the licensee was able to compensate for the wind direction sensor by the backup system that had the capability to provide redundant meteorological data relative to wind speed, wind direction, and temperature. All meteorological instruments were operable at the time of this inspection.

The inspector confirmed that the licensee sampled bottom sediment at the vicinity of liquid effluent discharge point and positioned a TLD at the mouth of discharge canal, as required by the Offsite Dose Calculation Manual (ODCM).

During the site tour on November 5, 1997, the inspector observed an area outside the RCA, on owner controlled property, which contained material dredged from the discharge canal in the period between 1976 and 1987. According to licensee surveys, the dredged material contained trace concentrations of radioactive material. The pile occupied an area of about 11,200 square meters. The inspector reviewed the licensee's Survey/Sampling Work Plan for the dredge pile. The inspector determined that the Survey/Sampling Work Plan was complete and well documented for guiding decommissioning efforts.

The requirements of 10 CFR 20.2002 describes that, in part, "the licensee may apply to the Commission for approval of proposed procedures, not otherwise authorized in the regulations in this chapter, to dispose of licensed material generated in the licensee's activities." The licensee was not able to determine if they had ever made an application to the NRC to dispose of dredging spoils onsite in the owner controlled area, and was continuing to review. From review of NRC records, it is not apparent that such application was ever received. This item is considered unresolved pending verification that such application was or was not submitted relative to this matter. **(URI 50-213/97-11-01)**.

The inspector determined that the licensee did have dredging approval permits issued by the U.S. Army Corps Engineers (Permit No. 87-5024) and by the Commissioner of Environmental Protection, State of Connecticut (Permit No. 109, January 15, 1987).

The inspector examined well water stations A and B which had been generally operational since the commencement of the plant operations. Wells A and B were always used to supply process water, with the exception of three months (November 1986 to January 1987), when well water stations C and D were made operational. The C and D wells were subsequently discontinued due to the very high mineral content that made the water unusable for plant process purposes. Well water stations A and B were operational at the time of this tour and were subject to frequent sampling in accordance with environmental monitoring program requirements.

c. Conclusion

Within the scope of these particular observations and findings, the inspector determined that the licensee implemented an appropriate sampling program to support the REMP relative to these specific monitoring stations and requirements.

R1.2 Implementation of the Tritium (H-3) Effluent Control Program

a. Inspection Scope (84750-03)

The purpose of this review was to ascertain the radiological consequence and impact on public health and safety (and the environment), with reference to applicable regulatory requirements, relative to tritium released from, or monitored at, Haddam Neck. During this inspection, the inspector reviewed: (1) the potential for an unquantified tritium release pathway to the discharge canal, from ground water collected in the external containment sump (ECS)(i.e., tritium activity that may have been released but not normally monitored or controlled); and (2) impact to public health and safety and the environment due to H-3 release from the site. To investigate these issues, the inspector reviewed licensee's annual reports, dose assessment results, and the radioactive liquid effluent control program, including H-3 monitoring and analysis efforts.

a.1 The Potential Unquantified H-3 Releases and H-3 Analytical Methodology:

To assess the potential unquantified H-3 releases and the licensee's H-3 analytical methodology, the inspector performed the following:

(1) Reviewed the ECS water release pathway from the ECS to the discharge canal;

(2) Interviewed former Chemistry Managers;

(3) Reviewed tritium measurement results and release permits;

(4) Reviewed annual reports;

(5) Performed an independent projected dose calculation using the NRC PCDose code; and

(6) Reviewed the licensee's H-3 analytical methodology and laboratory quality control (QC) program.

a.2 The Evaluation of the Public Health and Safety and the Environment:

To assess the evaluation of the public health and safety and the environment, the inspector performed the following:

(1) Reviewed historical H-3 discharge data;

(2) Reviewed historical H-3 measurement results for the onsite well A and B; and

(3) Evaluated total body dose due to H-3 in the onsite well A and B water.

b. Observations and Findings

b.1 The Potential Unquantified H-3 Releases and H-3 Analytical Methodology

b.1.1 Review of the ECS Water Release Pathway

The inspector reviewed the ECS water release pathway. The ECS ground water was normally released to the discharge canal (a sampling location) through the storm drain system upon being pump to, and drained from, an open trench surrounding the 115KV switchyard. However, configuration of the trench may have occasionally allowed ECS water to be drained from the trench to an area outside of the radiological controlled area that was not normally sampled. To alleviate this problem, the licensee blocked the open trench with a dam in September 1997 near the ECS to direct the water flow to the storm drain system and discharge canal. From that point on, ECS water was generally released only through the storm drain system. Release events involving contaminated liquid drained from the open trench are documented in Inspection Report No. 50-213/97-08.

b.1.3 Interviews with Former Chemistry Managers

The inspector interviewed three former Chemistry Managers (serving from 1969 to 1994) relative to H-3 measurement and dose assessment methodologies for the ECS samples, including H-3 activity in 1976, the first year in which tritium was measured in ECS water samples. Based on these discussions and record reviews, the following information was developed:

On May 19, 1976, the licensee discovered H-3 activity in the routine ECS water sample. The licensee prepared Plant Information Reports (PIR) accordingly (PIR Nos. 76-66 and 76-138). The licensee's investigation suggested that the source of H-3 was likely due to leakage from any one of a number of potential sources (e.g., radioactive waste tank, test tanks, the steam generator blowdown, or the radwaste test tank discharge line under the drumming room floor. Subsequently, the drumming room floor was core drilled in the vicinity of where the discharge line ties into the service water return line. Core drilling indicated severe erosion of discharge line which resulted in the accumulation of water in the area which was likely collecting in the ECS sump. The licensee repaired the discharge line. Since the repair, only minor tritium activity has been measured in the ECS, as shown in Column 5 of Tables 1 and 2.

The tritium activity at the ECS samples indicated that the leakage was likely from the test tanks due to similarity of the tritium activity. The inspector noted that the ECS sump was the lowest elevation in the surrounding area, therefore, any subterrain leakage in the vicinity would be expected to be collected in the ECS.

In accordance with the design of the liquid waste processing system, processed water is collected in the test tanks to be sampled and analyzed prior to release to the discharge canal. A grab sample is obtained and analyzed for radioactivity (including H-3), to assure conformance with regulatory requirements prior to release to the discharge canal. As part of this process, a projected dose calculation is made to demonstrate that the resultant dose will not exceed regulatory specifications.

At the time that this leakage pathway was discovered in 1976, chemistry management reasoned, that since the test tank samples were always collected and analyzed for gamma and tritium activities, and projected dose calculations to the public were always performed before discharge (as required by the TS), additional projected dose calculations to account for the minor leakage of tritium to the ECS from the test tanks would constitute redundant accounting of the activity, and consequently was unnecessary. There were no gamma emitters detected in the ECS water samples; and dose contribution was determined to be insignificant, as shown in Column 5 of Tables 1 and 2. Accordingly, no separate accounting of ECS water was accomplished.

The 1976 projected dose to the public (whole body dose for adults) due to all radioactive liquid releases from Haddam Neck was 0.086 mrem, including tritium. This is a fraction of the TS limit (3 mrem/year). The 1975 and 1977 projected doses to the public (whole body doses for adults) were 0.81 mrem and 0.56 mrem, respectively.

b.1.4 Review of Tritium Measurement Results and Release Permits

In December 1996, the licensee discontinued any liquid discharges from tanks to the environment. Only ECS water was pumped to the discharge canal. The analytical results of the ECS water indicated only minor tritium activity. Since that time, the licensee has accounted for tritium released through this ECS pathway by considering it as a batch release in accordance with existing procedures and regulatory requirements.

In this manner, specific sampling and analysis is performed and documented (including projected dose to the public), before ECS water is pumped and released to the discharge canal. The inspector noted that gamma emitters were not detected in any ECS samples. The licensee has updated the ODCM and associated procedures to reflect this practice.

In summary, since December 1996, the ECS water was the only radioactive liquid effluent source. Measured tritium activities in the ECS water (i.e., 6.86E-6 to 3.15E-4 µCi/ml) were lower than the regulatory value found in 10 CFR 20, Appendix B (i.e., 1.0E-3 µCi/ml). Dose assessment information is contained in Table 2 of this inspection report.

b.1.5 Review of Annual Reports

The inspector reviewed the selective licensee assessment of annual dose to the public as a result of tritium releases by examining the 1973 to 1996 semiannual/annual effluent and environmental reports that the licensee is required to make in accordance with regulatory specifications. The inspector determined that the dose contribution by H-3 was minimal and well within regulatory requirements, as shown in Table 2 of this inspection report.

b.1.6 NRC PCDose Code

The inspector reviewed the 1997 ECS water discharge permits including associated projected dose calculation results. The inspector independently performed a projected dose calculation using the NRC PCDOSE code. The total amount of H-3 release from January 1997 to September 1997 was 17.4 curies. The average dilution flow rate was about 7,000 gallons/minute during this period. Projected dose to the public (whole body dose for adults) using the NRC PCDOSE code was 3.76E-4 mrem, a small fraction of TS limits (3 mrem/year).

b.1.7 H-3 Analytical Methodology and QC Program

The inspector reviewed the licensee's analytical methodology for H-3. The licensee used two H-3 analytical approaches: (1) filtering the ECS water sample using a mixed resin bed to remove any complex ions or naturally occurring radioactive elements, such as radium-226, radium-228, and potassium-40; or (2) distilling the ECS water sample when the water sample contained a high turbidity (brackish water). The inspector noted that the licensee made efforts to effect the optimum assessment of tritium in the ECS water sample, and determined that the licensee's

methodologies were acceptable.

The QC program for analyses of H-3 samples was conducted by the chemistry laboratory. The H-3 QC program consisted of measurements of blind duplicate, spike samples, blank samples, and control charts. The inspector reviewed selected data (September and October 1997) and determined that the licensee's H-3 QC program was very well implemented in accordance with associated procedures.

b.2 The Evaluation of the Public Health and Safety and the Environment

b.2.1 Review of EPA-520/3-74-007

The inspector reviewed "EPA-520/3-74-007, Radiological Surveillance Study at the Haddam Neck PWR Nuclear Power Station, Office of Radiation Programs, USEPA, December 1974." This document characterized and described: (1) radionuclides in water on site (plant water); (2) airborne radioactive discharges; (3) radionuclides in liquid wastes; (4) radionuclides in the aquatic environment; (5) radionuclides in environmental air; (6) radionuclides and radiation in the terrestrial environment; and (7) summary and conclusions. The inspector used this document to establish a radiological point of reference.

b.2.2 Historical H-3 Discharge Data

The NRC published the Radiological Effluent Technical Specifications (RETS) in 1981 to provide numerical guides for design objectives and limiting conditions to meet the criterion "As Low As is Reasonably Achievable (ALARA) in light-water-cooled nuclear power reactor effluents" (10 CFR 50, Appendix I). The RETS specifies the annual dose limit, such as 3 mrem/year for radioactive liquid releases. The licensee adopted the RETS in 1986.

Prior to the RETS, the licensee was required to comply with 10 CFR 20, Appendix B, Table II effluent concentrations. For example, the effluent concentration limit for H-3 was 3E-3 µCi/cc. The inspector compared historical H-3 discharge concentration against the 10 CFR 20, Appendix B, Table II effluent concentrations from the commencement of the plant operations through 1980. From 1981 (when NRC published the new RETS) to present, the inspector compared the H-3 releases to the RETS annual dose limitation of 3 mrem/year.

The comparison results of H-3 activities are listed in Table 1 of this report. The licensee always met the H-3 concentration limits for the effluent requirement as listed in 10 CFR 20, Appendix B, Column 2. The licensee did not measure any positive H-3 activity from the commencement of the plant operations in 1967 to 1975 in the ECS water, as shown in Table 1 of this inspection report. In 1976, the licensee started measuring H-3 activity in routine ECS water samples, as described in Section b.1.3 of this inspection report. The licensee estimated, conservatively, the annual H-3 release through the ECS using the highest H-3 measurement result and maximum water flow rate for the ECS (listed in Column 4 of Table 1 of this report). The highest percentage of potentially unquantified H-3 release was 1.87% of total quantified H-3 released in 1977.

The comparison results of projected doses due to H-3 are listed in Table 2 of this inspection report. The licensee's projected doses, as listed in Column 1 of Table 2 this inspection report, were well below the limit. The licensee conservatively estimated the annual H-3 release through the ECS using the highest H-3 measurement result and maximum water flow rate for the ECS (listed in Column 3 of Table 2). The inspector used the PCDose code to calculate the projected dose due to potentially unquantified tritium and listed the results in Column 4. The highest percentage dose contribution due to potentially unquantified tritium release was 1.72% in 1983. The NRC requirements permitted unquantified release to a maximum 10% of total dose due to radioactive liquid release (Regulatory Position of Regulatory Guide 1.109). Accordingly, the licensee met the NRC requirements relative to the monitoring and analysis of tritium release to the environment.

b.2.3 Historical H-3 Measurement Results for the Onsite Well

The licensee monitored H-3 activities for onsite wells, which are located along the discharge canal outside of the security fence in the peninsula. The licensee had used onsite well water (known as Wells A or B) for specific domestic usage, such as shower and toilet. Historical H-3 measurement results of the onsite well water are listed in Table 3 and illustrated in Figure 1 in this report. As shown, the highest H-3 measurement results for the onsite well water were during the period of May-July 1975, which was during a refueling outage (May 17-June 30, 1975). Other elevated H-3 measurements (e.g., January 1978 and January 1982, etc.) were also during the refueling outages. The empirical evidence suggests that, due to the shallowness of the wells A or B (about 5-10 feet depth), and the minimum service water discharge during the outages, H-3 activities in wells A or B may be elevated during refueling outages.

The inspector requested to the licensee to take grab samples along the discharge canal and from the well water system (Wells A&B and in-plant well water) on November 4, 1997. The licensee took grab samples and analyzed them on November 5, 1997. The sampling locations and H-3 analytical results are shown in Figure 2 in this report. All analytical results were less than 215 pCi/l, which was about background for tritium in the environment. This observation appears to confirm that the source of H-3 in well water was most likely from the discharge canal due to shallowness of wells; and minimum service water flow (which results in minimum dilution) during the refueling outages.

In July 1976, the National Interim Primary Drinking Water Regulations were published by the EPA. An average annual concentration resulting in total body dose of 4 mrem/year was established as 20,000 pCi/l of H-3 based on standard annual drinking water consumption. The EPA drinking water regulations were established for public water suppliers (those that serve more than 25 people) and considered all age groups, such as infant, child, teen, and adult.

The licensee's Environmental TS (or ODCM, a part of RETS that was established after 1981) required the licensee to notify the NRC whenever H-3 measurements exceeded 20,000 pCi/l in an environmental water sample. The licensee's report of exceeding 20,000 pCi/l of H-3 of the onsite well water in 1975, as listed in Table 3, did not constitute a violation of any NRC requirement.

b.2.4 Evaluation of Total Body Dose for Onsite Well A/B Water Tritium

As previously discussed, the licensee used onsite well water (known as Wells A or B) for specific domestic usage, such as shower and toilet. Though it was not usually used for drinking water due to mineral content, taste, and some biological fouling of the well, it is not evident that CY ever established a specific prohibition against drinking the water, though bottled water was available onsite for drinking purposes.

During a review of the historical H-3 activity data for the onsite well water, the inspector noted that 1975 had the highest H-3 measurement results since the commencement of plant operations. Therefore, the inspector calculated a projected dose, assuming that this water was consumed by an individual at a standard rate. The inspector used the basic equation listed in Regulatory Guide 1.109.

Dose = (Activity) (Drinking Water Consumption Rate) (Dose Factor)
mrem = (pCi/liter) (liter/month) (mrem/pCi)

where: Drinking Water Consumption Rate for adult = 730 liters/year
= 60.8 liter/month
Dose Factor = 1.05E-7 mrem/pCi

The maximum organ dose rate conversion factors (dose factor) for ingestion of drinking water was published by the NRC in January 1990, NUREG/CR-5512, Residual Radioactive Contamination From Decommissioning (Draft). The dose factor of tritium was specified as 6.7E-8 mrem/pCi, a lower value than listed in Regulatory Guide 1.109. Notwithstanding, the inspector used the H-3 dose factor value listed in Regulatory Guide 1.109 for this dose assessment (1.05E-7 mrem/pCi).

The dose assessment of the monthly and the annual doses are listed in Table 4. The annual total body dose would have been 0.82 mrem in 1975, for any person drinking only the onsite well water for the entire year. This assessment indicates that there would be insignificant dose impact to licensee employees or the public that could have been exposed to tritium in drinking water as a result of plant operations.

c. Conclusion

Based on the above reviews and interviews, the inspector determined the following conclusions:

- Tritium released through the ECS water in May 1976 was monitored and reported in the 1976 semiannual effluent reports;

- Analytical methodology, including the QC program, for the ECS tritium was good;

- Establishing the ECS water discharge permit to control releases, not only for H-3 but also for gamma emitters, was good;

- Monitoring and analysis records support that the licensee did not exceed any regulatory limit relative to liquid effluent release of tritium or violate H-3 release limits to the discharge canal;

- The source of well water H-3 appeared to be from the discharge canal;

- Tritium activities of onsite well water system and the discharge canal were less than 215 pCi/l, which were background level, on November 5, 1997;

- The ECS H-3 discharges did not impact the public health and safety and the environment since the commencement of the plant operations; and

- The specific use of the onsite well water did not have any significant dose consequence to the licensee employees.

R8 Previously Identified Item

(Closed) URI 50-213/97-08-04

During the previous inspection conducted during August 11 - September 19, 1997, one unresolved item (URI 50-213/97-08-04) was identified by an NRC inspector. The content of the URI was, in part, "reporting of releases of H-3 from ground water sources to the NRC was an unresolved item pending NRC review of the licensee's bases for not "permitting" the releases until December 1996. Based on the above reviews, the inspector stated that the URI 50-213/97-08-04 was closed since no violation of NRC regulations was apparent (See Section b.2.2 of this inspection report for detail).

PARTIAL LIST OF PERSONS CONTACTED

Licensee

*#G. Bouchard, Services Director
*#J. Bourassa, QA Supervisor
*S. Carnesi, System Engineer
#W. Eakin, Site Characterization
#J. Haley, Licensing
*J. Haseltine, Engineering Director
*#S. Herd, Chemistry Manager
*B. van Nieuwenhuise, Chemistry Supervisor
*G. van Noordenner, Licensing Manager
*#R. Mellor, Director Site Operation & Decommissioning
#R. Shippe, Site Characterization
*J. Tarzia, HP/Chemistry Technical Support
#A. Yates, Chemistry

NRC

*W. Raymond, Sr. Resident Inspector

* Denotes those present at the exit meeting on October 13, 1997.
# Denotes those present at the exit meeting on November 7, 1997. The inspectors also interviewed other licensee personnel.

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened URI 50-213/97-11-01, NRC approval for Discharge Canal Dredging.

Closed URI 50-213/97-08-04, Review of potential unquantified H-3 releases.

Discussed None

Table 1, Amount of Tritium Release since Haddam Neck Operation
Before Radiological Effluent TS Requirement Issued

Year	(1) Effluent Release Limit, µCi/ml	(2) Average Released Activity, µCi/ml	(3) Total H-3 Release (curies)	(4) Potentially Unquantified H-3 Release, ECS (curies)	(5) % of Potentially Unquantified H-3 releases	Remarks
1967	3.0E-3	1.16E-6	220	MDA (6)	-	(7)
1968	3.0E-3	9.13E-6	1,735	MDA	-	
1969	3.0E-3	2.72E-5	5,163	MDA	-	
1970	3.0E-3	1.10E-5	7,377	MDA	-	
1971	3.0E-3	8.20E-6	5,832	MDA	-	
1972	3.0E-3	7.70E-6	5,890	MDA	-	
1973	3.0E-3	2.00E-5	3,900	MDA	-	
1974	3.0E-3	3.20E-6	2,241	MDA	-	
1975	3.0E-3	8.51E-6	5,670	MDA	-	
1976	3.0E-3	7.96E-6	4,854	1,931 (8)	39.8 % (8)	(8)
1977	3.0E-3	8.97E-6	6,666	124.4	1.87%	
1978	3.0E-3	5.12E-6	3,944	38.8	0.98%	
1979	3.0E-3	5.70E-6	3,546	7.4	0.21%	
1980	3.0E-3	1.01E-6	3,291	29.9	0.91%	

(1) H-3 Effluent Concentration Limit, 10 CFR 20, Appendix B, Table II
(2) Annual Average Released Activity
(3) Total H-3 Release
(4) Potentially Unquantified H-3 Release through the ECS
(5) [Column (4)/Column (3)] x 100
(6) MDA = Minimum Detectable Activity
(7) Operation started in October, 1967
(8) Reported through routine report mechanism

Table 2, Amount of Tritium Release since Haddam Neck Operation
After Radiological Effluent TS Requirement

Year	(1) TB Dose, due to all Liquid Pathway (mrem)	(2) Monitored H-3 Release (Curies)	(3) Potentially Unquantified H-3 Release, through ECS (Curies)	(4) TB Dose due to Potentially Unquantified H-3 (mrem)	(5) % Dose due to Potentially Unquantified H-3 Release	
1981	1.0	3,291	214	4.62E-3	0.758 %	(6)
1982	0.61	5,290	15.7	3.39E-4	0.056 %	
1983	0.086	4,050	68.6	1.48E-3	1.72 %	
1984	1.30	3,600	6.6	1.43E-4	0.011 %	
1985	0.13	5,760	12.8	2.77E-4	0.213 %	
1986	0.594	2,580	8.37	1.81E-4	0.030 %	(7)
1987	0.93	3,170	4.15	8.95E-5	0.0096 %	
1988	0.292	1,180	2.37	5.12E-5	0.0153 %	
1989	0.0922	4,810	34.1	7.37E-4	0.80 %	
1990	0.3	989	5.89	1.27E-4	0.0424 %	
1991	0.827	4,630	25.15	5.43E-4	0.0657 %	
1992	0.401	863	42.12	9.10E-4	0.227 %	
1993	0.2038	4,000	1.58	3.41E-5	0.0168 %	
1994	0.5627	1,420	3.55	7.67E-5	0.0136 %	
1995	0.1756	699	3.60	7.78E-5	0.0443 %	
1996	0.066	540	3.03	6.55E-5	0.0992 %	
1997	3.76E-4	17.4	None	-	-	(8)

(1) Total Body Dose (Adult) due to Radioactive Liquid Release Pathways
(2) Total Monitored Release, published in Semiannual/Annual Reports
(3) Potentially Unquantified H-3 Release through the ECS
(4) Total Body Dose (Adult) due to Potentially Unquantified H-3 Release
(5) % Dose due to Potentially Unquantified H-3, [Column (4)/Column (1)] x 100
(6) Effective the NRC RETS
(7) Effective the Licensee's RETS
(8) From January 1997 to September 1997

Table 3, Historical Tritium Data for the Onsite Well

Date	H-3, pCi/l	Date	H-3, pCi/l	Date	H-3, pCi/l
Jan. 70	4,277	Mar. 75	4,840	Jan. 78	12,000
Feb. 70	4,180	Apr. 75	4,500	Feb. 78	11,600
Mar. 70	4,018	May 75	27,300	Mar. 78	11,400
Apr. 70	3,823	Jun. 75	28,000	Apr. 78	5,720
Jun. 70	4,698	Jul. 75	20,300	May 78	4,750
Jul. 70	6,674	Aug. 75	7,890	Jun. 78	5,680
Aug. 70	3,920	Sep. 75	8,180	Jul. 78	5,960
Sep. 70	5,702	Oct. 75	10,100	Aug. 78	4,510
Oct. 70	6,318	Nov. 75	6,300	Sep. 78	4,780
Dec. 70	6,836	Dec. 75	2,500	Oct. 78	4,060
Jan. 71	6,156	Jan. 76	5,380	Nov. 78	3,650
Apr. 71	6,739	Feb. 76	3,970	Dec. 78	2,690
Oct. 71	5,573	Mar. 76	4,090	Jan. 79	3,770
Jan. 72	5,249	Apr. 76	5,620	Feb. 79	4,170
Jun. 72	5,087	May 76	5,210	Mar. 79	5,910
Sep. 72	3,953	Jun. 76	6,670	Apr. 79	5,270
Nov. 72	4,277	Jul. 76	6,450	May 79	7,300
Mar. 73	3,065	Aug. 76	8,630	Jun. 79	7,060
Aug. 73	1,853	Sep. 76	5,960	Jul. 79	3,710
Dec. 73	6,091	Oct. 76	4,770	Aug. 79	3,130
Jan. 74	1,690	Nov. 76	6,540	Sep. 79	3,170
Feb. 74	4,600	Dec. 76	4,700	Oct. 79	4,570
Mar. 74	7,900	Jan. 77	2,190	Nov. 79	6,510
Apr. 74	8,100	Feb. 77	3,100	Dec. 79	5,690
May 74	9,300	Mar. 77	3,150	Jan. 80	5,470
Jun. 74	6,600	Apr. 77	2,618	Feb. 80	5,270
Jul. 74	6,816	May 77	3,290	Mar. 80	3,990
Aug. 74	4,330	Jun. 77	3,090	Apr. 80	5,780
Sep. 74	4,340	Jul. 77	2,570	May 80	7,330
Oct. 74	3,680	Aug. 77	6,590	Jun. 80	4,080
Nov. 74	3,400	Sep. 77	13,900	Jul. 80	4,800
Dec. 74	3,410	Oct. 77	13,100	Aug. 80	4,960
Jan. 75	3,290	Nov. 77	15,100	Sep. 80	5,870
Feb. 75	4,620	Dec. 77	15,100	Oct. 80	1,770

Table 3, Historical Tritium Data for the Onsite Well (Cont'd)

Date	H-3, pCi/l	Date	H-3, pCi/l	Date	H-3, pCi/l
Nov. 80	2,550	Jan. 83	9,920	Mar. 85	3,600
Dec. 80	3,550	Feb. 83	6,800	Apr. 85	4,300
Jan. 81	1,920	Mar. 83	6,090	May 85	10,000
Feb. 81	2,480	Apr. 83	7,040	Jun. 85	5,300
Mar. 81	2,010	May 83	6,970	Jul. 85	9,100
Apr. 81	2,790	Jun. 83	4,830	Aug. 85	4,000
May 81	3,000	Jul. 83	3,000	Sep. 85	6,700
Jun. 81	2,930	Aug. 83	2,030	Oct. 85	7,380
Jul. 81	8,570	Sep. 83	4,250	Nov. 85	7,000
Aug. 81	8,505	Oct. 83	4,080	Dec. 85	8,300
Sep. 81	14,700	Nov. 83	3,590	Jan. 86	7,100
Oct. 81	5,960	Dec. 83	5,880	Feb. 86	6,200
Nov. 81	14,400	Jan. 84	7,000	Mar. 86	7,100
Dec. 81	12,700	Feb. 84	7,450	Apr. 86	4,900
Jan. 82	7,910	Mar. 84	6,220	May 86	3,400
Feb. 82	5,160	Apr. 84	5,130	Jun. 86	3,200
Mar. 82	8,860	May 84	4,680	Jul. 86	3,000
Apr. 82	4,090	Jun. 84	8,830	Aug. 86	1,800
May 82	5,500	Jul. 84	6,160	Sep. 86	2,700
Jun. 82	3,420	Aug. 84	4,700	Oct. 86	2,000
Jul. 82	5,250	Sep. 84	5,250	Nov. 86	91 *
Aug. 82	8,670	Oct. 84	5,150	Dec. 86	< 70 *
Sep. 82	4,150	Nov. 84	9,900	Jan. 87	< 84 *
Oct. 82	8,270	Dec. 84	5,700	Feb. 87	1,800
Nov. 82	7,120	Jan. 85	5,500	Mar. 87	2,700
Dec. 82	8,250	Feb. 85	3,000	Apr. 87	2,800

* Wells C and D were very deep wells and used for three months period for the domestic usage. The use of water from these wells were discontinued due to very high mineral contents, such as iron.

Table 3, Historical Tritium Data for the Onsite Well (Cont'd)

Date	H-3, pCi/l	Date	H-3, pCi/l	Date	H-3, pCi/l
May 87	4,400	Jul. 89	7,400	Mar. 95	2,070
Jun. 87	2,300	Aug. 89	7,300	Jun. 95	741
Jul. 87	7,000	Sep. 89	2,900	Sep. 95	720
Aug. 87	7,600	Oct. 89	4,200	Dec. 95	286
Sep. 87	8,700	Nov. 89	3,500	Mar. 96	< 502
Oct. 87	7,000	Dec. 89	2,300	Jun. 96	< 462
Nov. 87	3,310	Mar. 90	3,150	Sep. 96	1,523
Dec. 87	2,800	Jun. 90	1,910	Dec. 96	864
Jan. 88	3,900	Sep. 90	919		
Feb. 88	4,000	Dec. 90	445		
Mar. 88	4,400	Mar. 91	1,630		
Apr. 88	2,400	Jun. 91	2,980		
May 88	2,000	Sep. 91	4,470		
Jun. 88	3,800	Dec. 91	4,560		
Jul. 88	2,300	Mar. 92	2,570		
Aug. 88	1,300	Jun. 92	2,200		
Sep. 88	2,000	Sep. 92	< 130		
Oct. 88	1,350	Dec. 92	908		
Nov. 88	1,200	Mar. 93	2,840		
Dec. 88	1,200	Jun. 93	5,430		
Jan. 89	1,100	Sep. 93	889		
Feb. 89	3,000	Dec. 93	893		
Mar. 89	2,100	Mar. 94	944		
Apr. 89	3,300	Jun. 94	1,341		
May 89	7,200	Sep. 94	3,291		
Jun. 89	6,000	Dec. 94	1,544		

Figure 1, Onsite Well Tritium Measurement Results

Figure 2, Tritium Measurement Results along the Discharge Canal
(All measurement results were less than 215 pCi/l)

Table 4, Adult Total Body Dose due to Onsite Well Water Drinking

Month, 1975	Well Water H-3 Activity (pCi/l)	Adult Total Body Dose (mrem/month)
January	3,290	2.10E-2
February	4,620	2.95E-2
March	4,840	3.09E-2
April	4,500	2.87E-2
May	27,300	1.74E-1
June	28,000	1.79E-1
July	20,300	1.30E-1
August	7,890	5.04E-2
September	8,180	5.22E-2
October	10,100	6.45E-2
November	6,300	4.02E-2
December	2,500	1.06E-2
	Annual Total Body Dose	8.16E-1 mrem/1975